

**WHAT IS CLAIMED IS:**

1. A method of transmitting signals via telephone cables comprising the steps of:

selecting an aggregate of adjacent twisted pairs within the telephone cable for optimization of signal transmission;

5 transmitting mutually coherent signals via said selected twisted pairs;

measuring electromagnetic fields generated by mutual interaction between said selected twisted pairs at a receiving end of any of said selected twisted pair; and

reducing crosstalk between said selected twisted pairs by transmitting of said mutually coherent signals having amplitudes and phases corresponding to the destructive interference.

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2. The method of transmitting signals of claim 1, wherein the step of measuring electromagnetic fields further comprising the steps of:

measuring amplitudes and phases of interfering electromagnetic fields; and

establishing constructive and destructive interference between said selected twisted pairs.

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3. The method of transmitting signals of claim 2, further comprising the step of cable characterization by measuring crosstalk of each said selected twisted pair induced by the same frequency tones in other pairs of said aggregate.

20 4. The method of transmitting signals of claim 3, wherein said twisted pairs have regular twist periods.

5. The method of transmitting signals of claim 4, further comprising the step of establishing the respective amplitudes and phases of interfering electromagnetic fields to provide destructive  
25 interference.

6. The method of transmitting signals of claim 3, wherein said twisted pairs have irregular twist periods.

7. The method of transmitting signals of claim 6, further comprising the step of establishing the respective amplitudes and phases of interfering electromagnetic fields to provide destructive interference.

8. A system for transmitting signals via telephone cables having twisted pairs comprising:  
a plurality of transmission units for transmitting respective digital signals via adjacent twisted pairs of the telephone cables, each transmission unit comprising  
an encoder for re-coding the digital signal into DSL format,  
IFFT block for obtaining a set of parallel samples of different frequencies, and  
equalizer for providing interference between electromagnetic fields of said adjacent twisted pairs; and

spectral bonding unit comprising an initiation block for characterization of said twisted pairs and establishing an equalization algorithm, and an equalization block for providing feedback to said equalizers according to the equalization algorithm.

9. The system for transmitting signals of claim 8, further comprising a re-timing block for establishing timing relations between transmission units of said plurality, said re-timing block is connected to each said equalizer and to said spectral bonding unit.

10. The system for transmitting signals of claim 9, wherein said equalization block has two-way communication with each said equalizer for receiving information on each tone modulation in each said set of samples and returning equalization data back to said equalizer.

11. The system for transmitting signals of claim 10, further comprising a plurality of receiving units corresponding to respective plurality of said transmission units for

receiving analog signals with cancelled crosstalk that are converted to digital signals of optimized signal transmission.

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